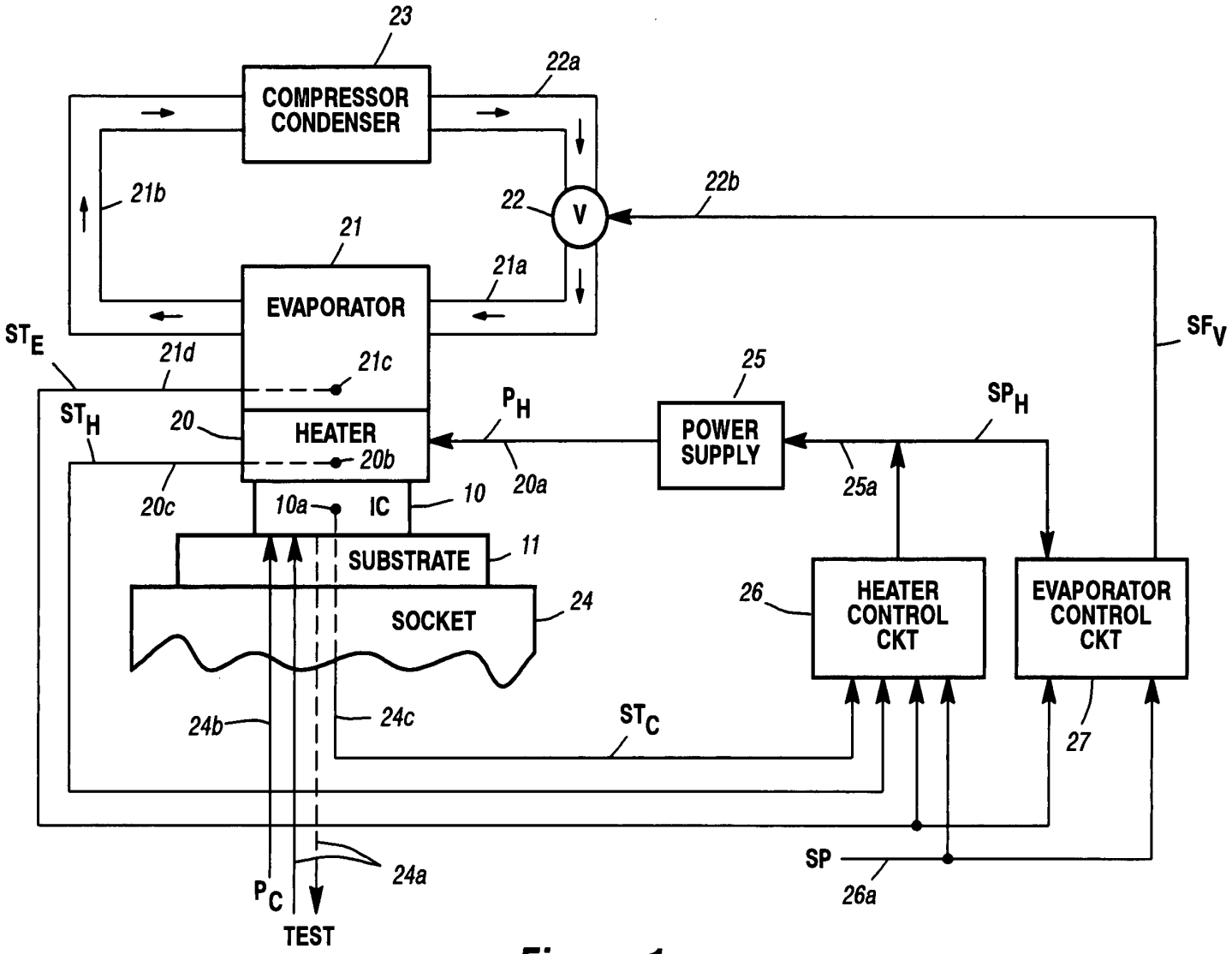
23
COMPRESSOR CONDENSER
22a
21b
22
V
22b
21
EVAPORATOR
21a
ST_E
21d
21c
SF_V
25
ST_H
20
HEATER
20b
P_H
POWER SUPPLY
SP_H
20c
10a
IC
10
20a
25a
SUBSTRATE
11
26
HEATER CONTROL CKT
EVAPORATOR CONTROL CKT
SOCKET
24
24b
24c
ST_C
27
SP
26a
24a
P_C
TEST

Figure 1

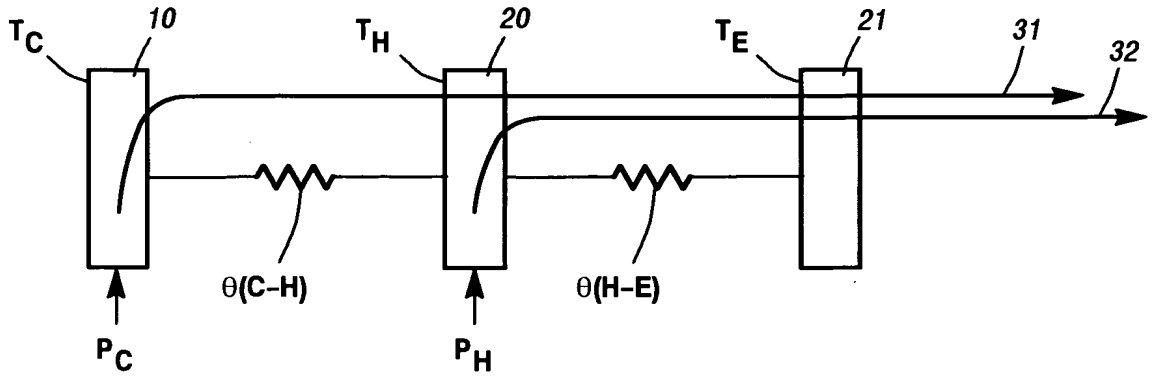

Figure 2

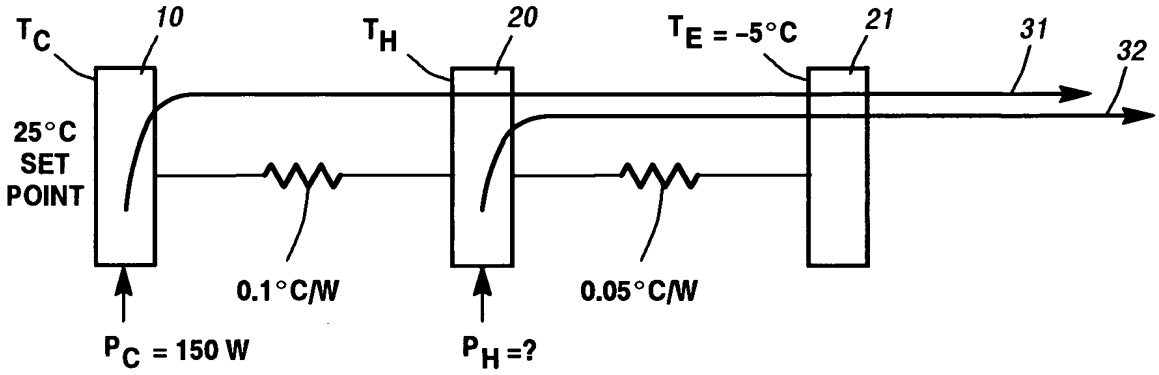

Figure 3

eq. 1 → $T_C - T_E = P_C [\theta(C-H) + \theta(H-E)] + P_H [\theta(H-E)]$

eq. 2 → $25 - (-5) = 150\ (0.1 + 0.05) + P_H\ (0.05)$

eq. 3 → $30 = 22.5 + 0.05\ P_H$

eq. 4 → P_H = 150 watts

Figure 4

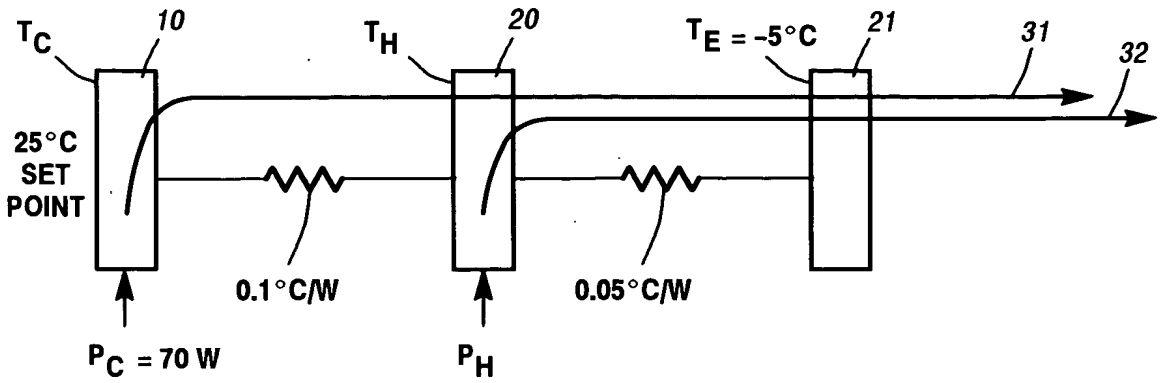

Figure 5

eg. 10 → 25 – (–5) = 70 (0.1 + 0.05) + P_H (0.05)

eg. 11 → 30 = 10.5 + 0.05 P_H

eg. 12 → P_H = 390 watts ↔ too big

Figure 6

eg. 13 → CONTROL CKT 27 SETS T_E = + 7°C

eg. 14 → 25 – (+7) = 70 (0.1 + 0.05) + P_H (0.05)

eg. 15 → 18 = 10.5 + 0.05 P_H

eg. 16 → P_H = 150 watts

Figure 7

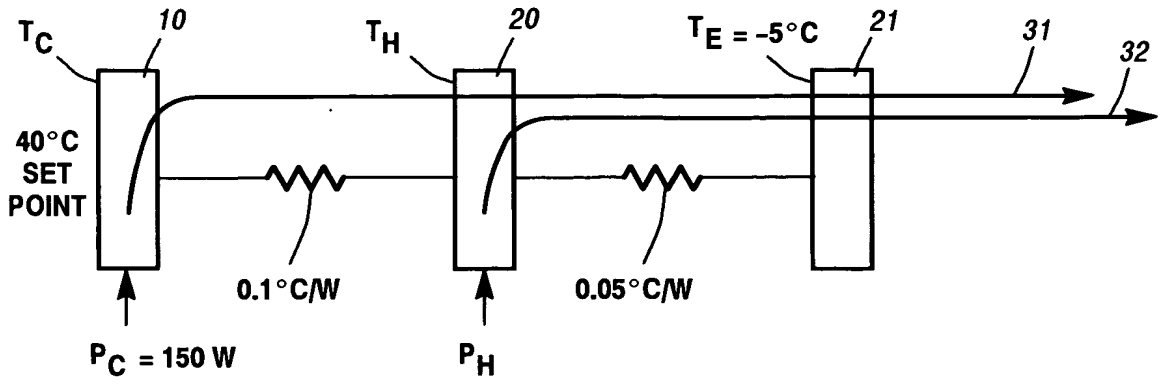

Figure 8

eg. 20 → 40 - (-5) = 150 (0.1 + 0.05) + P_H (0.05)

eg. 21 → 45 = 22.5 + 0.05 P_H

eg. 22 → P_H = 450 watts ↔ too big

Figure 9

eg. 23 → CONTROL CKT 27 SETS T_E = + 10°C

eg. 24 → 40 - (10) = 150 (0.1 + 0.05) + P_H (0.05)

eg. 25 → 30 = 22.5 + 0.05 P_H

eg. 26 → P_H = 150 watts

Figure 10

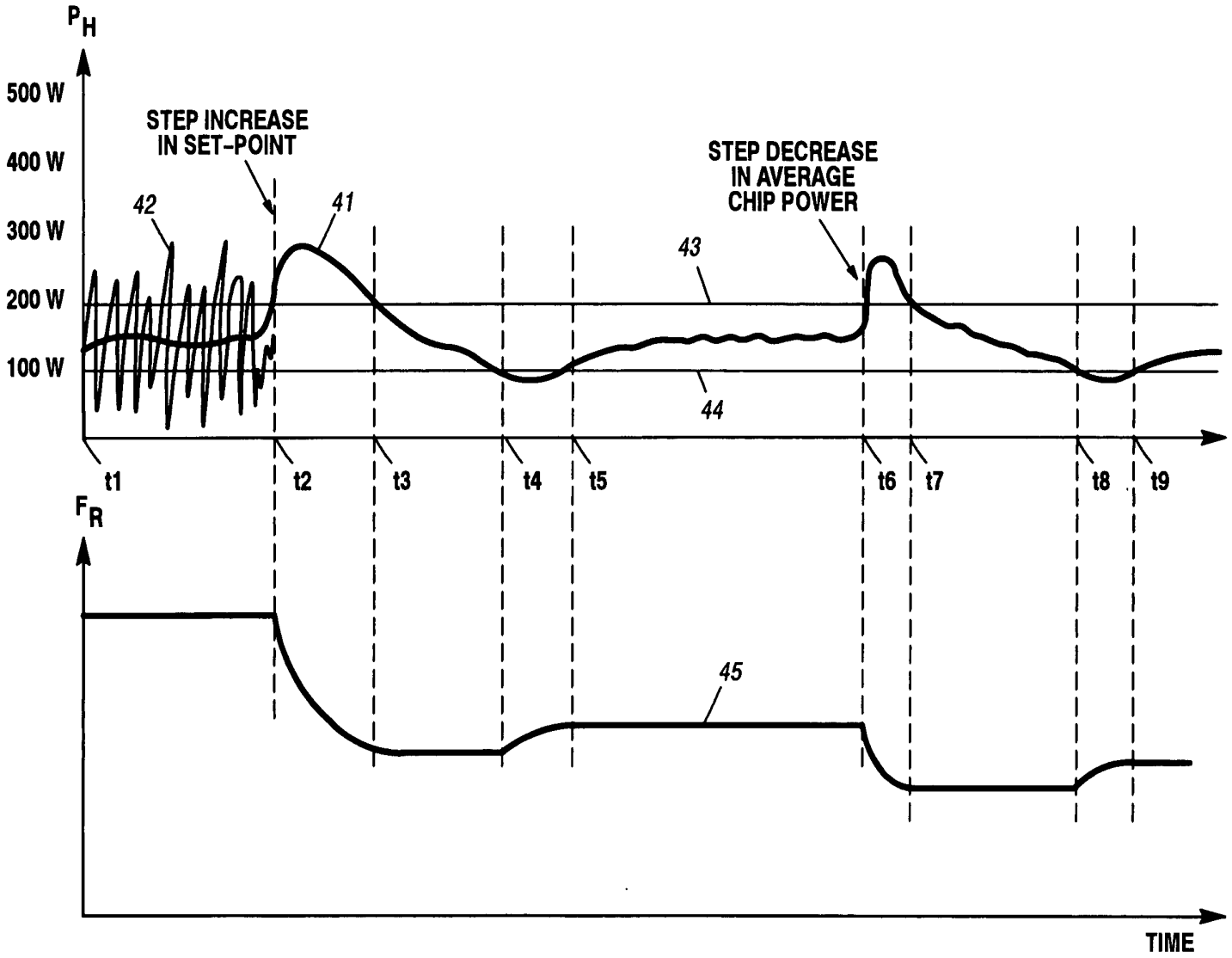
P_H
500 W
400 W
300 W
200 W
100 W
STEP INCREASE
IN SET-POINT
STEP DECREASE
IN AVERAGE
CHIP POWER
42
41
43
44
t1
t2
t3
t4
t5
t6
t7
t8
t9
F_R
45
TIME

Figure 11

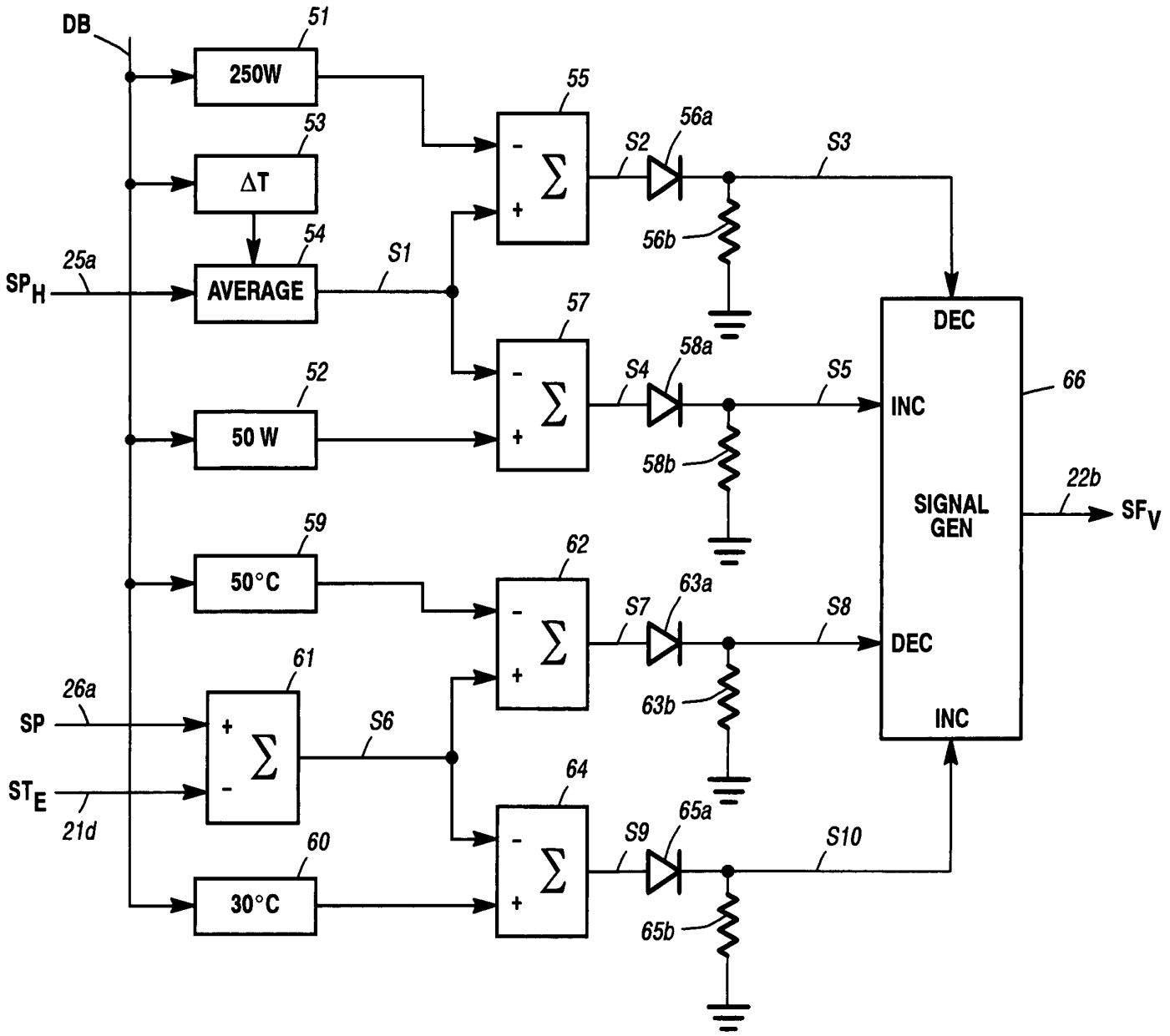
DB
51
250W
53
ΔT
54
AVERAGE
25a
SP_H
S1
52
50 W
55
56a
S2
S3
56b
57
58a
S4
S5
58b
59
50°C
62
63a
S7
S8
63b
61
26a
SP
S6
ST_E
21d
64
65a
S9
S10
65b
60
30°C
DEC
INC
SIGNAL GEN
DEC
INC
66
22b
SF_V

Figure 12